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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

TH

Office Action Summary	Application No.	Applicant(s)	
	10/748,236	KOENENKAMP, INGO	
	Examiner	Art Unit	
	Juan A. Torres	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 22 August 2007.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,6-14 and 16-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6-14 and 16-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 22 August 2007 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Drawings

The modifications to the drawings were received on 08/22/2007. These modifications are accepted by the Examiner.

The drawings are objected to because they fail to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: "22" (see figure 2. It seems that this number should be "2" [see figure 1]). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

The modifications to the specification were received on 08/22/2007. These modifications are accepted by the Examiner.

The Applicant is reminded that 35 USC § 112 first paragraph indicates that "The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms".

The disclosure is objected to because of the following informalities:

a) In all the Specification, the recitation "$\Delta\varphi$" is improper (see figure 9); it is suggested to be changed to "$\Delta\Phi$" (see i.e. page 12 line 6, line 13, line 14, line 16; page 13 line 7, line 9)

b) In all the Specification, the recitation "RQ^+", "RQ^-"; "RI^+"; "RI^-" is improper (see figure 9); it is suggested to be changed to "RQ+", "RQ-"; "RI+"; "RI-" respectively (see i.e. page 12 line 6, line 8, line 9, lines 12-22; page 13 lines 3-20)

c) The recitation in page 16 line 3 "requency" is improper because it is not properly constructed; it is suggested to be changed to "frequency";

Appropriate correction is required.

Response to Arguments

Regarding claim 1:

Applicant's arguments filed on 08/22/2007 have been fully considered but they are not persuasive.

The Applicant contends, "Claim 1 recites a "first interpolator to adjust a phase of an in-phase signal" and "a second interpolator to adjust a phase of a quadrature signal."

The Becker patent does not disclose these features. The Becker patent discloses a timing loop 60 which generates signals for controlling two interpolation circuits. As shown in Figure 2, the first interpolation circuit 50 receives an in-phase (I) component of a received signal and the second interpolation circuit 50 receives a quadrature (Q) component of the received signal. However, circuits 50 do not adjust phases of the I and Q received signals. Rather, the interpolation circuits of Becker perform time shifts and frequency adjustments of the I and Q signals, so that the outputs of circuits 50 are time-position locked to symbol locations of the received signal. (This is clear from Figure 3 of Becker where shifts are performed relative to the time axis - compare this, for example, to the non-limiting embodiment of Figure 7 of Applicant's drawings where the phase of at least the Q signal is shifted to correspond to point "C" on the eye diagram.) These differences are clear from columns 5 and 6 of the Becker patent. At column 5, Becker discloses that the interpolation circuits perform two key functions. First, to produce a resampled signal having twice the frequency of the symbol data rate to prevent aliasing. And second, to ensure that the resampled signal is time-position locked to the baseband sigmal, so that the samples are taken at symbol locations of the baseband signal. (See lines 51-65). At column 6, Becker goes on to explain that each interpolator circuit 50 includes an interpolator 80 which interpolates between the points of the output stream 48 (based on time displacements), to produce an output frequency that matches a sampling frequency, f_s. By using appropriate time displacements, each circuit 50 produces sampled interpolation points that correspond to symbol locations in the received signal. (See lines 18-52). Thus, interpolators 50 do not perform the

functions of adjusting the phases of in-phase and quadrature signals. Becker, therefore, does not teach or suggest the first and second phase interpolators of claim 1. Moreover, while timing loop 60 generates signals for separately controlling circuits 50, Becker does not disclose that circuits 50 adjust the quadrature signal phase independently from the phase adjustment of the in-phase signal, as is further recites in claim 1. Because the Becker patent does not disclose all the features of claim 1, Applicant submits that Becker does not anticipate this claim. Furtherance of claim 1 and its dependent claims to allowance is therefore respectfully requested" (emphasis in original).

The Examiner disagrees and asserts, that, as indicated in the previous Office action, Becker discloses a first interpolator to adjust a phase of an in-phase signal (figure 2, block 50 in the in-phase branch; column 5 line 52 to column 6 line 17); and a second interpolator to adjust a phase of a quadrature signal (figure 2, block 50 in the quadrature branch; column 5 line 52 to column 6 line 17), where the second interpolator adjusts the quadrature signal phase independently from the phase adjustment of the in-phase signal performed by the first interpolator (figure 2, block 60 column 7 lines 5-23 controls the in-phase and quadrature interpolators independently).

To time shift a signal is equivalent to shift the phase of the signal. In fact Becker uses a <u>polyphase</u> filter 50 (emphasis added). The geek word "poly" means "several" (As a prefix, "poly" meaning more than one or many (eg, polyvalent - capable of many valences; polyphase – <u>capable of many phases</u>).

Becker also clearly indicated "The first sequence of digitized samples is processed by a digital rotator <u>to frequency-and phase-correct</u> the first sequence of

digitized samples" (abstract); and also "For fine channel acquisition, the modulator includes a digital rotator that receives the first sequence of digitized samples and adjusts frequency and phase of the first sequence of digitized samples" (column 2 lines 36-39)

With respect to the polyphase filter 50 Becker discloses "A commutator 86 operates on the interpolator outputs 84 to downsample or decimate the outputs 84 by a downsampling parameter B. If the downsampling parameter B is made equal to the upsampling parameter A, the filter bank 82 operates as a time-shifting or phasing filter. Time increment quantization is defined by the number of polyphase filter stages, and can be made arbitrarily fine by increasing A" (column 6 lines 35-41); "The phase of the sampling of the controllable digital filter 50 is established in conjunction with the filter bank 82 discussed above, using a timing loop 60" (column 7 lines 5-7).

For example Luthra (US 5274372 A) "Sampling rate conversion using polyphase filters with interpolation" discloses in the abstract "The resolution of the sampling rate conversion is a function of the number of phases N of the polyphase filters".

It is clear that every shift time of the polyphase filter 50 means a different phase of the output.

For these reasons and the reason stated en the previous Office action, the rejection of claim 1 is maintained.

Regarding claim 2:

Applicant's arguments filed on 08/22/2007 have been fully considered but they are not persuasive.

The Applicant contends, "Dependent claim 2 recites that "a non-orthogonal relationship exists between the adjusted phases of the quadrature and in-phase signals." The interpolators 50 of Becker perform time shifts and frequency adjustments, not phase adjustments in the manner recited in claim 1. Consequently, Becker does not disclose adjusting the phases of I and Q signals to be non-orthogonal to one another. This is an especially advantageous feature of the invention because, for example, it is allows the Q signal to be out of phase (relative to the standard 90° phase difference) with the I signal in order to achieve an optimal position for data sampling that reduces or minimizes bit-errors in the receiver. None of these features are disclosed by Becker. Accordingly, it is submitted that claim 2 is allowable, not only by virtue of its dependency from claim 1 but also based on the features separately recited therein".

The Examiner disagrees and asserts, that, as indicated in the previous Office action, Becker discloses claim 1, Becker also discloses that a non-orthogonal relationship exists between the adjusted phases of the quadrature and in-phase signals (column 6 lines 18-52). Becker discloses two independent polyphase filter 50 that re controlled independently by time loop 60.

For these reasons and the reason stated en the previous Office action, the rejection of claim 2 is maintained.

<u>Regarding claim 3:</u>

Applicant's arguments filed on 08/22/2007 have been fully considered but they are not persuasive.

The Applicant contends, "Dependent claim 3 recites that "the second interpolator adjusts the quadrature signal phase based on one or more predetermined increments." Becker does not disclose these features, e.g., Becker only discloses performing incremental time shifts (see Figure 3), not phase adjustments as recited in claim 3".

The Examiner disagrees and asserts, that, as indicated previously (see respond to argument regarding claim 1 above) Becker discloses a polyphase filter with incremental time shifts or incremental phase shifts.

For these reasons and the reason stated en the previous Office action, the rejection of claim 3 is maintained.

<u>Regarding claim 10:</u>

Applicant's arguments filed on 08/22/2007 have been fully considered but they are not persuasive.

The Applicant contends, "Claim 10 recites "a phase adjuster to adjust a phase of the quadrature signal independently from a phase of the in-phase clock signal, wherein the adjusted phase of the quadrature signal corresponds to a clock signal." Becker does not disclose these features. Accordingly, claim 10 and its dependent claims are allowable".

The Examiner disagrees and asserts, that, as indicated in the previous Office action Becker discloses a demodulator to generate in-phase and quadrature signals from a data signal (figure 2, blocks 30, 32, and 34; column 4 lines 40-50); and a phase adjuster to adjust a phase of the quadrature signal independently from a phase of the in-phase clock signal (figure 2, block 50 column 5 line 52 to column 6 line 17), wherein

the adjusted phase of the quadrature signal corresponds to a clock signal (figure 2, block 60 column 7 lines 5-23).

Becker discloses a polyphase filter with incremental time shifts or incremental phase shifts (see respond to arguments regarding claim1).

For these reasons and the reason stated en the previous Office action, the rejection of claim 10 is maintained.

Regarding claims 11 and 12:

Applicant's arguments filed on 08/22/2007 have been fully considered but they are not persuasive.

The Applicant contends, "Dependent claim 11 recites that "a non-orthogonal relationship exists between the phases of the quadrature and in-phase signals after said adjustment," and dependent claim 12 recites that "the phase adjuster adjusts the quadrature signal phase based on one or more predetermined increments." These features are also not disclosed by Becker.".

The Examiner disagrees and asserts, that, as indicated in the previous Office action Becker discloses a non-orthogonal relationship exists between the adjusted phases of the quadrature and in-phase signals (column 6 lines 18-52), and Becker also discloses that the phase adjuster adjusts the quadrature signal phase based on one or more predetermined increments (column 6 lines 34-52 "time increment quantization").

For these reasons and the reason stated en the previous Office action, the rejection of claims 11 and 12 are maintained.

Regarding claim 14:

Applicant's arguments filed on 08/22/2007 have been fully considered but they are not persuasive.

The Applicant contends, "Claim 14 recites "adjusting a phase of the quadrature signal independently from a phase of the in-phase signal, wherein said adjusting results in a non-orthogonal relationship between the phases of the quadrature and in-phase signals." As explained above, Becker does not disclose these features. Applicant therefore submits that claim 14 and its dependent claims are allowable".

The Examiner disagrees and asserts, that, as indicated in the previous Office action Becker discloses generating in-phase and quadrature signals from a data signal (figure 2, blocks 30, 32, and 34; column 4 lines 40-50); and adjusting a phase of the quadrature signal independently from a phase of the in-phase signal (figure 2, block 60 column 7 lines 5-23 controls the in-phase and quadrature interpolators independently), where the adjusting results in a non-orthogonal relationship between the phases of the quadrature and in-phase signals (column 6 lines 18-52).

For these reasons and the reason stated en the previous Office action, the rejection of claim 14 is maintained.

Regarding claim 26:

Applicant's arguments filed on 08/22/2007 have been fully considered but they are not persuasive.

The Applicant contends, "Claim 26 recites features similar to those that patentably distinguish claim 1 from the Becker patent. Applicant therefore submit that claim 26 and its dependent claims are allowable".

The Examiner disagrees and asserts, that, because the rejection of claim 1 is maintained, the rejection of claim 26 is also maintained.

For these reasons and the reason stated en the previous Office action, the rejection of claim 26 is maintained.

Regarding claims 4-7 and 16-24:

Applicant's arguments filed on 08/22/2007 have been fully considered but they are not persuasive.

The Applicant contends, "Claims 4-7 and 16-24 were rejected under 35 USC § 103(a) for being obvious in view of a Becker-Lee combination. This rejection is traversed, in part, on grounds that the Lee patent does not teach or suggest the features of base claim 1 missing from the Becker patent. The Lee patent discloses using two phase interpolators 29a and 29b to generate I and Q phase clock signals. The clock signals (CKI and CKQ) are adjusted so that their edges are aligned with the transition portion between two data bits, DO and D1. (See column 3, lines 41-50 with reference to Figure 3.). However, the phases of clock signals CKI and CKQ are not independently adjusted as required by base claim 1. Rather, Lee discloses that the clock signals must be 90° out-of-phase with one another. (See column 4, lines 35-37). As a result of this 90° phase relationship, setting the phase of the I signal will automatically result in setting the phase of the Q signal, i.e., once the I phase is set, the

Q phase is 90° from this phase. (See Figure 5(a)). By requiring a 90° phase difference between the I and Q clock signals, it is clear that the Lee patent does not teach or suggest a "second interpolator [that] adjusts the quadrature signal phase independently from the phase adjustment of the in-phase signal performed by the first interpolator" as recited in claim 1. (Emphasis added). Applicant therefore submits that claim 4 is allowable at least by virtue of its dependency from claim 1. Dependent claim 6 separately recites that "the second interpolator adjusts the phase of the quadrature signal to coincide with a second predetermined point on an eye diagram, the phase of the quadrature signal at the second predetermined point adjusted by the second interpolator to be non-orthogonal to the phase of the in-phase signal at said first predetermined point on the eye diagram." The Lee patent does not teach or suggest these features, i.e., as indicated above Lee requires its I and Q clock signals to maintain a 90° phase separation. Neither phase interpolator of Lee adjusts the phase of the Q signal to intentionally be non-orthogonal to the I signal phase relative to respective points on an eye diagram. Applicant therefore submits that claim 6 is allowable, not only by virtue of its dependency from claims 1 and 4 but also based on the features separately recited therein. Claim 7 recites that "the second predetermined point is a widest point on the eye diagram." When the Q signal phase corresponds to this point, in accordance with one non-limiting embodiment data sampling optimally occurs and the receiver operates at a reduced or minimized bit-error rate. The Lee patent does not teach or suggest the features of claim 7. Claim 20 recites that adjusting the quadrature signal phase includes "mapping a phase of the quadrature signal onto an eye diagram

of the data signal; determining a difference between the phase of the quadrature signal and a phase which coincides with a first point on the eye diagram; and adjusting the quadrature signal phase to reduce said difference." These features are not taught or suggested by Lee or Becker, whether taken alone or in combination. Claim 21 recites that "the quadrature signal phase is adjusted to at least substantially eliminate said difference." These features are not taught or suggested by Lee or Becker, whether taken alone or in combination. Claim 22 recites that "the quadrature signal phase is adjusted in one or more predetermined increments to reduce said difference." These features are not taught or suggested by Lee or Becket, whether taken alone or in combination. Claim 23 recites that the first point is a widest point on the eye diagram. These features are not taught or suggested by Lee or Becker, whether taken alone or in combination. Claim 24 recites that "adjusting the quadrature signal phase to reduce said difference does not change the phase of the in-phase signal." These features are not taught or suggested by Lee or Becker, whether taken alone or in combination. In fact, Lee teaches away from these features by disclosing a constant 90 degree phase relationship between its I and Q clock signals".

The Examiner disagrees and asserts, that, because the rejection of claims 1 and 2 are maintained, the rejection of claims 4-7 and 16-24 are also maintained.

Regarding claim 6, Becker and Lee disclose claim 4, Becker also discloses where the adjusting results in a non-orthogonal relationship between the phases of the quadrature and in-phase signals (column 6 lines 18-52). Becker doesn't specifically disclose that the second interpolator adjusts the phase of the quadrature signal to

coincide with a predetermined point on an eye diagram. Lee discloses that the second interpolator adjusts the phase of the quadrature signal to coincide with a predetermined point on an eye diagram (figures 3 and 4 CKI, column 3 line 35 to column 4 line 8).

Regarding claim 7, Lee and Becker disclose claim 4, Lee also discloses that the predetermined point is a widest point on the eye diagram (figure 3 block 34, column 3 line 35 to column 4 line 8).

Regarding claim 20 Becker disclose claim 14, Becker doesn't specifically disclose mapping a phase of the quadrature signal onto an eye diagram of the data signal; determining a difference between the phase of the quadrature signal and a phase which coincides with a first point on the eye diagram; and adjusting the quadrature signal phase to reduce said difference. Lee discloses mapping a phase of the quadrature signal onto an eye diagram of the data signal (figure 3, column 3 line 35 to column 4 line 8); determining a difference between the phase of the quadrature signal and a phase which coincides with a first point on the eye diagram (figures 3 and 4 block 33 column 3 line 35 to column 4 line 8); and adjusting the quadrature signal phase to reduce said difference (figures 3 and 4 CKQ, column 3 line 35 to column 4 line 8). Becker and Lee teachings are analogous art because they are from the same field of endeavor of Quadrature communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Becker the eye diagram technique disclosed by Lee. The suggestion/motivation for doing so would have been to gain efficiency of the system

generating two quadrature clock signals being 90 degrees out of phase with each other (Lee column 2 lines 5-9).

Regarding claim 21, Lee and Becker disclose claim 20, Lee also discloses that the quadrature signal phase is adjusted to at least substantially eliminate said difference (figure 3 block 33, column 3 line 35 to column 4 line 8).

Regarding claim 22, Lee and Becker disclose claim 20, Lee also discloses that the quadrature signal phase is adjusted in one or more predetermined increments to reduce said difference (figure 3 block 34, column 3 line 35 to column 4 line 8).

Regarding claim 23, Lee and Becker disclose claim 20, Lee also discloses that the first point is a widest point on the eye diagram (figure 3 block 34, column 3 line 35 to column 4 line 8).

Regarding claim 24, Lee and Becker disclose claim 20, Lee also discloses that the adjusting the quadrature signal phase to reduce said difference does not change the phase of the in-phase signal (figures 3 and 4 blocks 29a and 29b, column 3 line 35 to column 4 line 12).

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

For these reasons and the reason stated en the previous Office action, the rejection of claims 4-7 and 16-24 are maintained.

Regarding claims 31-33:

Applicant's arguments filed on 08/22/2007 have been fully considered but they are not persuasive.

The Applicant contends, "New claims 31-33 have been added to the application. Claim 31 recites that "the second interpolator adjusts the phase of the quadrature signal to the second predetermined point by one or more predetermined phase increments." These features are not taught or suggested by Lee or Becker, whether taken alone or in combination. Claim 32 recites that "a difference between the phase of the in-phase signal at the first predetermined point and the phase of the quadrature signal at the second predetermined point corresponds to said one or more predetermined phase increments." These features are not taught or suggested by Lee or Becker, whether taken alone or in combination. Claim 33 recites "sampling the in-phase and quadrature phase signals based on the independently adjusted phases of the in-phase and quadrature signals." These features are not taught or suggested by Lee or Becker, whether taken alone or in combination".

The Examiner disagrees and asserts, that, regarding claim 31, Lee and Becker disclose claim 6, Becker also discloses that the second interpolator adjusts the phase of the quadrature signal to the second predetermined point by one or more predetermined phase increments (column 6 lines 34-52 "time increment quantization". A polyphase filter adjust the phase up to N values, the value of N determines the increments); regarding claim 32, Lee and Becker disclose claim 31, Becker also discloses that a difference between the phase of the in-phase signal at the first predetermined point and

the phase of the quadrature signal at the second predetermined point corresponds to said one or more predetermined phase increments (column 6 lines 34-52 "time increment quantization". A polyphase filter adjust the phase up to N values, the value of N determines the increments); and regarding claim 33, Lee and Becker disclose claim 31, Becker also discloses that sampling the in-phase and quadrature phase signals based on the independently adjusted phases of the in-phase and quadrature signals (figure 2, block 60 column 7 lines 5-23 controls the in-phase and quadrature interpolators independently).

For these reasons, claims 31-33 are rejected.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 8-14 and 25-29 are rejected under 35 U.S.C. 102(b) as being anticipated by Becker (US 5612975 A).

Regarding claim 1, Becker discloses a first interpolator to adjust a phase of an in-phase signal (figure 2, block 50 in the in-phase branch; column 5 line 52 to column 6 line 17); and a second interpolator to adjust a phase of a quadrature signal (figure 2, block 50 in the quadrature branch; column 5 line 52 to column 6 line 17), where the second interpolator adjusts the quadrature signal phase independently from the phase

adjustment of the in-phase signal performed by the first interpolator (figure 2, block 60 column 7 lines 5-23 controls the in-phase and quadrature interpolators independently).

Regarding claim 2, Becker discloses claim 1, Becker also discloses that a non-orthogonal relationship exists between the adjusted phases of the quadrature and in-phase signals (column 6 lines 18-52).

Regarding claim 3, Becker discloses claim 1, Becker also discloses that the second interpolator adjusts the quadrature signal phase based on one or more predetermined increments (column 6 lines 34-52 "time increment quantization". A polyphase filter adjust the phase up to N values, the value of N determines the increments).

Regarding claim 8, Becker discloses claim 1, Becker also discloses that a controller which sets at least one configuration value of the second phase interpolator (figure 2, block 60 column 7 lines 5-23 controls the in-phase and quadrature interpolators independently), where the second phase interpolator adjusts the quadrature signal phase independently from the phase of the in-phase signal based on said at least one configuration value (figure 2, block 60 column 7 lines 5-23 controls the in-phase and quadrature interpolators independently).

Regarding claim 9, Becker discloses claim 8, Becker also discloses that at least one configuration value includes an offset value for the quadrature signal phase (figure 2, block 60 column 7 lines 5-18).

Regarding claim 10, Becker discloses a demodulator to generate in-phase and quadrature signals from a data signal (figure 2, blocks 30, 32, and 34; column 4 lines

40-50); and a phase adjuster to adjust a phase of the quadrature signal independently from a phase of the in-phase clock signal (figure 2, block 50 column 5 line 52 to column 6 line 17), wherein the adjusted phase of the quadrature signal corresponds to a clock signal (figure 2, block 60 column 7 lines 5-23).

Regarding claim 11, Becker discloses claim 10, Becker also discloses a non-orthogonal relationship exists between the adjusted phases of the quadrature and in-phase signals (column 6 lines 18-52).

Regarding claim 12, Becker discloses claim 10, Becker also discloses that the phase adjuster adjusts the quadrature signal phase based on one or more predetermined increments (column 6 lines 34-52 “time increment quantization”).

Regarding claim 13, Becker discloses claim 10, Becker also discloses a sampler that samples the data signal based on said clock signal (figure 2 block 57 column 6 lines 62-67).

Regarding claim 14, Becker discloses generating in-phase and quadrature signals from a data signal (figure 2, blocks 30, 32, and 34; column 4 lines 40-50); and adjusting a phase of the quadrature signal independently from a phase of the in-phase signal (figure 2, block 60 column 7 lines 5-23 controls the in-phase and quadrature interpolators independently) where the adjusting results in a non-orthogonal relationship between the phases of the quadrature and in-phase signals (column 6 lines 18-52).

Regarding claim 25, Becker discloses claim 14, Becker also discloses sampling the data signal based on the adjusted quadrature signal phase (figure 2 block 57 column 6 lines 62-67).

Regarding claim 26, Becker discloses a first circuit (figure 1 block 16 and figure 2 block 65 column 4 lines 18-26; and column 7 lines 27-39); and a second circuit which includes (a) a demodulator to generate in-phase and quadrature signals from a data signal (figure 2, blocks 30, 32, and 34; column 4 lines 40-50); and (b) a phase adjuster to adjust a phase of the quadrature signal independently from a phase of the in-phase clock signal (figure 2, block 50 column 5 line 52 to column 6 line 17), where the adjusted phase of the quadrature signal corresponds to a clock signal used to control the first circuit (figure 1 block 16 and figure 2 block 65 column 4 lines 18-26; and column 7 lines 27-39).

Regarding claim 27, Becker discloses claim 26, Becker also discloses that a non-orthogonal relationship exists between the phases of the quadrature and in-phase signals after said adjustment (column 6 lines 18-52).

Regarding claim 28, Becker discloses claim 26, Becker also discloses that the phase adjuster adjusts the quadrature signal phase based on one or more predetermined increments (column 6 lines 34-52 “time increment quantization”).

Regarding claim 29, Becker discloses claim 26, Becker also discloses that the first circuit is at least one of a processor and a memory (figure 1 block 16 and figure 2 block 65 column 4 lines 18-26; and column 7 lines 27-39).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

> invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 4, 6-7, 16-24 and 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker as applied to claim 1 above, and further in view of Lee (US 6801066 B2).

Regarding claim 4, Becker discloses claim 1, Becker doesn't specifically disclose that the first interpolator adjusts the phase of the in-phase signal to coincide with a first predetermined point on an eye diagram. Lee discloses that the first interpolator adjusts the phase of the in-phase signal to coincide with a predetermined point on an eye diagram (figures 3 and 4 CKI, column 3 line 35 to column 4 line 8). Becker and Lee teachings are analogous art because they are from the same field of endeavor of Quadrature communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Becker the eye diagram technique disclosed by Lee. The suggestion/motivation for doing so would have been to gain efficiency of the system generating two quadrature clock signals being 90 degrees out of phase with each other (Lee column 2 lines 5-9).

Regarding claim 6, Becker and Lee disclose claim 4, Becker also discloses where the adjusting results in a non-orthogonal relationship between the phases of the quadrature and in-phase signals and the adjusting is independent (column 6 lines 18-52). Becker doesn't specifically disclose that the second interpolator adjusts the phase of the quadrature signal to coincide with a second predetermined point on an eye diagram. Lee discloses that the second interpolator adjusts the phase of the quadrature

signal to coincide with a predetermined point on an eye diagram (figures 3 and 4 CKI, column 3 line 35 to column 4 line 8). Becker and Lee teachings are analogous art because they are from the same field of endeavor of Quadrature communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Becker the eye diagram technique disclosed by Lee. The suggestion/motivation for doing so would have been to gain efficiency of the system generating two quadrature clock signals being 90 degrees out of phase with each other (Lee column 2 lines 5-9).

Regarding claim 7, Lee and Becker disclose claim 6, Lee also discloses that the predetermined point is a widest point on the eye diagram (figure 3 block 34, column 3 line 35 to column 4 line 8). Becker and Lee teachings are analogous art because they are from the same field of endeavor of Quadrature communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Becker the eye diagram technique disclosed by Lee. The suggestion/motivation for doing so would have been to gain efficiency of the system generating two quadrature clock signals being 90 degrees out of phase with each other (Lee column 2 lines 5-9).

Regarding claim 31, Lee and Becker disclose claim 6, Becker also discloses that the second interpolator adjusts the phase of the quadrature signal to the second predetermined point by one or more predetermined phase increments (column 6 lines 34-52 “time increment quantization”. A polyphase filter adjust the phase up to N values, the value of N determines the increments).

Regarding claim 32, Lee and Becker disclose claim 31, Becker also discloses that a difference between the phase of the in-phase signal at the first predetermined point and the phase of the quadrature signal at the second predetermined point corresponds to said one or more predetermined phase increments (column 6 lines 34-52 “time increment quantization”. A polyphase filter adjust the phase up to N values, the value of N determines the increments).

Regarding claim 33, Lee and Becker disclose claim 31, Becker also discloses that sampling the in-phase and quadrature phase signals based on the independently adjusted phases of the in-phase and quadrature signals (figure 2, block 60 column 7 lines 5-23 controls the in-phase and quadrature interpolators independently).

Regarding claim 16, Becker disclose claim 14, Becker doesn't specifically disclose generating a representation of an eye diagram for the data signal; and adjusting the quadrature signal phase to coincide with a first point on the eye diagram. Lee discloses generating a representation of an eye diagram for the data signal (figure 3, column 3 line 35 to column 4 line 8); and adjusting the quadrature signal phase to coincide with a first point on the eye diagram (figures 3 and 4 CKQ, column 3 line 35 to column 4 line 8). Becker and Lee teachings are analogous art because they are from the same field of endeavor of Quadrature communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Becker the eye diagram technique disclosed by Lee. The suggestion/motivation for doing so would have been to gain efficiency of the

system generating two quadrature clock signals being 90 degrees out of phase with each other (Lee column 2 lines 5-9).

Regarding claim 17, Lee and Becker disclose claim 16, Lee also discloses that first point is a widest point on the eye diagram (figure 3 block 34, column 3 line 35 to column 4 line 8).

Regarding claim 18, Lee and Becker disclose claim 16, Lee also discloses adjusting the in-phase signal phase to coincide with a second point on the eye diagram (figure 3 block 33, column 3 line 35 to column 4 line 8).

Regarding claim 19, Lee and Becker disclose claim 18, Lee also discloses that the first point is a widest point (figure 3 block 34, column 3 line 35 to column 4 line 8)and the second point is a crossing point in the eye diagram (figure 3 block 33, column 3 line 35 to column 4 line 8).

Regarding claim 20, Becker disclose claim 14, Becker doesn't specifically disclose mapping a phase of the quadrature signal onto an eye diagram of the data signal; determining a difference between the phase of the quadrature signal and a phase which coincides with a first point on the eye diagram; and adjusting the quadrature signal phase to reduce said difference. Lee discloses mapping a phase of the quadrature signal onto an eye diagram of the data signal (figure 3, column 3 line 35 to column 4 line 8); determining a difference between the phase of the quadrature signal and a phase which coincides with a first point on the eye diagram (figures 3 and 4 block 33 column 3 line 35 to column 4 line 8); and adjusting the quadrature signal phase to reduce said difference (figures 3 and 4 CKQ, column 3 line 35 to column 4 line 8).

Becker and Lee teachings are analogous art because they are from the same field of endeavor of Quadrature communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Becker the eye diagram technique disclosed by Lee. The suggestion/motivation for doing so would have been to gain efficiency of the system generating two quadrature clock signals being 90 degrees out of phase with each other (Lee column 2 lines 5-9).

Regarding claim 21, Lee and Becker disclose claim 20, Lee also discloses that the quadrature signal phase is adjusted to at least substantially eliminate said difference (figure 3 block 33, column 3 line 35 to column 4 line 8).

Regarding claim 22, Lee and Becker disclose claim 20, Lee also discloses that the quadrature signal phase is adjusted in one or more predetermined increments to reduce said difference (figure 3 block 34, column 3 line 35 to column 4 line 8).

Regarding claim 23, Lee and Becker disclose claim 20, Lee also discloses that the first point is a widest point on the eye diagram (figure 3 block 34, column 3 line 35 to column 4 line 8).

Regarding claim 24, Lee and Becker disclose claim 20, Lee also discloses that the adjusting the quadrature signal phase to reduce said difference does not change the phase of the in-phase signal (figures 3 and 4 blocks 29a and 29b, column 3 line 35 to column 4 line 12).

Claim 30 is are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker as applied to claim 26 above, and further in view of Troemel (US 20020163981

A1). Regarding claim 30 Becker disclose claim 14, Becker doesn't specifically disclose the first circuit and second circuit are included on a same chip die. Troemel discloses using a same chip die (paragraph [0047]). Becker and Troemel teachings are analogous art because they are from the same field of endeavor of Quadrature communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Becker the single die technique disclosed by Troemel. The suggestion/motivation for doing so would have been to save cost and space, and to improve performance (Troemel paragraph [0047]).

Conclusion

Prior art made of record in the previous Office action, Knutson (US 5878088 A) discloses a timing recovery system suitable for use in a digital signal receiver, such as a cable or satellite television receiver, receiving a quadrature amplitude modulated (QAM) signal that also can be use for the rejections under 102(b) of the present Office action. The abstract of this patent discloses "A receiver is arranged for receiving a transmitted quadrature amplitude modulated (QAM) signal representing successive symbols, and including an in-phase (I) component and a quadrature (Q) component. In such a receiver, a timing recovery system includes a source of samples representing the QAM signal produced at a fixed frequency. A first chain of processing circuitry for the I component includes a first demodulator, coupled to the sample source, for demodulating the I component of the QAM signal to baseband; and a first interpolator, coupled to the first demodulator and responsive to a control signal, for producing I component samples taken at times synchronized to the transmitted symbols. A second

chain of processing circuitry for the Q component includes a second demodulator, also coupled to the sample source, for demodulating the Q component of the QAM signal to baseband; and a second interpolator, coupled to the second demodulator and responsive to a control signal, for producing Q component samples taken at times synchronized to the transmitted symbols. A phase error detector is coupled to the first and the second interpolators, and detects the phase error between the sample times of the I and Q component samples from the first and second interpolators and times of the successive transmitter symbols. A summer is coupled to the phase error detector and a source of a nominal delay signal. A numerically controlled delay circuit, is coupled to the summer, for producing the respective control signals for the first and second interpolators"

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juan A. Torres whose telephone number is 571-272-3119. The examiner can normally be reached on 8-6 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Juan Alberto Torres
08-23-2007

MOHAMMED GHAYOUR
SUPERVISORY PATENT EXAMINER